## REMARKS

This Amendment is submitted in Response to the Office Action mailed on April 19, 2001. Prior to this Amendment, Claims 1-6 were pending in the case. Claims 1 and 3 have been amended, Claims 7-10 have been added, and no claims have been cancelled. Thus, Claims 1-10 are pending in the case.

A marked up version of the claims showing the amendments is attached. The attached page is captioned "Version With Markings To Show Changes Made."

The Claim Amendments and the new claims are submitted to more clearly claim Applicants' invention, and are not submitted in response to any of the rejections. Also, Applicants submit that the amendments do not narrow the claims.

In Office Action paragraph numbers 1 and 2, provisional double patenting rejections were entered in view of co-pending application 09/448,127. Application serial number 09/448,127 has been expressly abandoned. Thus, Applicants request that the provisional double patenting rejections be withdrawn.

In Office Action paragraph number 3, Claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by Truax et al., U.S. Patent No. 5,175,774. Applicants respectfully disagree.

Truax et al. relates to the formation of a semiconductor wafer identifying number made of a binary dot-array encoding scheme. Truax et al. does not specifically describe the shape of each dot. Rather, Truax et al. purports to improve on known trench or depression shaped dots by using the binary array rather than teaching a new dot shape. See column 1, lines 24-32. Therefore, the dot to be marked by Truax et al. appears to have a typical trench or depression shape. In other words, Truax et al. does not disclose or teach a mark that has a protrusion which protrudes in the center portion upward from the surface of the article to be marked, as claimed in Claim 1.

Furthermore, the "2 micrometers" in Truax et al., as the Examiner pointed out, is not the size of a dot mark itself, but a center-to-center dot size in the dot array. Further, this "2 micrometers" size is a nominal value, with which Truax et al. tries to compare the dot arrays' occupation area on the wafer surface with the area occupied by conventional marks. See column 6, lines 49-63.

Truax et al. does not mention a height of a protrusion of the dot mark because the Truax et al dot does not have a protrusion. The "height" in Truax et al. means a length of the dot-array from the base line row. See column 4, line 66 through column 5, line 11.

Therefore, Truax et al. does not disclose or suggest the dot mark according to Claim 1, and Applicants request that this rejection be withdrawn.

In Office Action paragraph number 4, Claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by Lappalainen et al., U.S. Patent Number 5,632,916. Applicants respectfully disagree.

Lappalainen et al. pertains to marking a bright metal surface with a laser. The marked areas on the metal surface have a color different from the unmarked metal surface. The marked colored areas are substantially smooth and level with the metal surface surrounding the marked areas. See column 1, lines 5-12.

According to Lappalainen et al., a spot of impact of a laser beam is successively irradiated on a metal surface such that parts of the spot lights overlap each other, thus forming a continuous mark. As a result, an area of the metal surface, where the pulses do not overlap each other and which abuts on the spot of impact of the new pulse, obtains a color contrasting with the original metal surface, producing readable marks. Thus, Lappalainen et al. is not directed to formation of dot marks and of course does not disclose a dot mark having a protrusion which protrudes in the center portion, as claimed in Claim 1.

The "height of less than 1 micron" as pointed out by the Examiner is a thickness of the colored surface layer of a colored area. See column 2, lines 50-53. The surface of this area is substantially smooth and at the same level as the remaining surface of the metal surface. See column 3, lines 23-26. Therefore, this is not the height of any protrusion.

Therefore, Lappalainen et al. does not disclose or suggest the dot mark according to Claim1, and Applicants request that this rejection be withdrawn.

In Office Action paragraph 5, Claim 2 is rejected under 35 U.S.C. § 102(a) as being unpatentable over Truax et al. in view of Asakawa et al., E 198 10545. Applicants respectfully disagree.

As discussed above, Truax et al. does not disclose or suggest a dot mark as claimed in Claim 1. Therefore, this rejection is improper and should be withdrawn.

Furthermore, Asakawa et al. shows a bar code and not a dot mark. Therefore, Asakawa et al. does not show a dot mark having a protrusion.

Thus, Applicants submit that this rejection has been overcome and should be withdrawn.

In Office Action paragraph number 6, Claims 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakano et al., U.S. Patent number 4,734,558 in view of Lappalainen et al. Applicants respectfully disagree.

Nakano et al. does not disclose or suggest homogenizing an energy distribution of the laser beam by a homogenizer, as claimed in Claim 3. Although the Examiner asserts that "Light is homogenized through an optical system" according to Nakano et al., the optical system of Nakano et al. serves to reflect and expand the output light of the laser to form a parallel beam (column 3, lines 20-23), but does not homogenize the light.

Further, according to Nakano et al., the laser beam is not split by passing through a liquid crystal mask, as claimed in Claim 3. In Nakano et al., the beam splitter 231 serves to allow only a specific linearly polarized component to reach the light valve 232 (column 11, lines 9-11).

Still further, Nakano et al. does not disclose or suggest controlling a liquid crystal mask in which the maximum length of each pixel is 50 to 2,000 μm, or setting the energy density on a surface to be marked, of a split laser beam which passed through the liquid crystal mask to 1.0 to 15.0 J/cm$^2$ as claimed in Claim 3. Therefore, Nakano et al. does not disclose or suggest the invention as claimed in Claim 3, and the shape of a microdot mark of the present invention cannot be obtained by the method of Nakano et al.

As discussed above, Lappalainen et al. does not disclose or suggest a microdot mark having a protrusion. Applicants respectfully submit that there is no suggestion or motivation to combine Nakano et al. with Lappalainen et al. Even further, if those two references are combined, the combination does not result in Applicants' claimed invention.

Thus, Applicants' respectfully submit that the rejection has been overcome and should be withdrawn.

In Office Action paragraph 7, Claims 3-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over James et al., U.S. Patent number 5,463,200 in view of Azuma et al., U.S. Patent number 4,861,620. Applicants respectfully disagree.

James et al. does not teach or suggest the steps having the numerical values as claimed in Claim 3, such as setting the energy density on a surface to be marked, of a split laser beam which passed through the liquid crystal mask to 1.0 to 15.0 J/cm$^2$ or condensing the laser beam for each dot by a lens unit, which passed through the liquid crystal mask, onto the surface of the article to

be marked so that the maximum length of each dot is set to 1.0 to 15.0μm. Without such values, it is impossible to obtain the shape of a dot mark of the present invention.

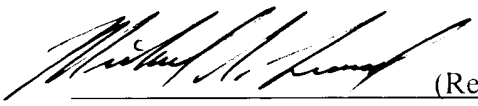
The Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to employ a known energy density range (1.1 to 5 Joule/cm$^2$) according to Azuma et al. in the method of James et al. However, Azuma et al. is directed to laser marking for irradiating a pigment layer on a surface of an article with patterned laser light to change the internal molecular structure of pigment to thereby change its color, so that a marking is formed. See the Abstract and the whole specification. Accordingly, Azuma et al. does not relate to dot mark formation. Therefore, it is not obvious to combine these two references. Even if the references are combined, it is apparently impossible to obtain the operations and effects of the Applicants' invention according to the method of Claim 3.

Thus, Applicants respectfully submit that this rejection has been overcome and should be withdrawn.

## CONCLUSION

Applicants respectfully submit that all of the rejections have been overcome and request that a Notice of Allowance be issued for this case.

Respectfully submitted,



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**Version With Markings To Show Changes Made**
**Chiba et al.**
**Serial No. 09/576,681**

1. (Once Amended) A microdot mark shape which is formed by a laser beam, on a surface of an article to be marked by using a laser as a light source, wherein

the microdot mark shape is made by dot marks each formed on each laser irradiated point,

the mark has a protrusion which protrudes in the center portion upward from the surface of the article to be marked, and

the length of each dot mark along the surface of the article to be marked is 1.0 to 15.0 μm [and the height of the protrusion is 0.01 to 5.0 μm].

3. (Once Amended) A method of forming a mark made by dots on the surface of an article to be marked by laser beams emitted from a pulse laser oscillator, comprising the steps of:

homogenizing an energy distribution of the laser beam emitted from the laser oscillator by a beam homogenizer;

forming a desired pattern by driving and controlling a liquid crystal mask in which the maximum length of each pixel is 50 to 2,000 μm and irradiating the liquid crystal mask with the laser beam homogenized by the beam homogenizer;

setting the energy density on a surface to be marked, of a split laser beam which passed through the liquid crystal mask to 1.0 to 15.0 J/cm$^2$ ; and

condensing the laser beam for each dot by a lens unit, which passed through the liquid crystal mask, [onto the surface of the article to be marked] so that the maximum length of each dot is set to 1.0 to 15.0 μm and imaging each dot onto the surface of the article to be marked.

7. A microdot mark shape according to claim 1, wherein the height of the protrusion is 0.01 to 5.0 μm.

8. A microdot mark shape according to claim 1, wherein a periphery of the protrusion of said dot mark is recessed.

9. A microdot mark shape according to claim 1 wherein the surface of the article to be marked is a front or a rear surface of an integrated circuit.

10. A microdot shape according to claim 1, wherein said dot mark is formed for product management or various securities.